PhD. SYNOPSIS

Vitamin D insufficiency and Obesity among young women – Prevalence, Association and mHealth Intervention

Submitted by

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INTRODUCTION

Vitamin D is a fat soluble vitamin. In world population more than 50% were affected with low vitamin D status(1).2.Vitamin D is a prohormone and having adequate plasma Vitamin D levels is viewed as a marker of good wellbeing. Aside from the grounded job of Vitamin D in keeping up with great skeletal wellbeing (counting osteoporosis, breaks, calcium, phosphorous, and bone digestion), Vitamin D insufficiency is likewise connected with diabetes, cardiovascular problems (CVDs), immune system , irresistible , and neuro-degenerative illnesses including Alzheimer's and Parkinson's sickness(2).

The major function of Vitamin D is act like a pre-hormone and it has the ability to target many important tissues in human body and the major role is to regulate normal blood calcium and phosphate.(3).vitamin D deficiency prevented by intake of vitamin D rich foods and adequate sun exposure.to get optimum level of vitamin d some factors plays an important role to get vitamin D naturally. It depends on exposure to sunlight, duration, use of sunscreen and clothing style(4).Experts agree that 25(OH)D of < 20 ng/ml is considered as vitamin D deficiency and 25(OH)D of 21-29 ng/ml is considered to be insufficient.(5).

Obesity is considered as accumulation of excess fat in human body affect total metabolism and also leads to cause many degenerative disorders. Overweight and obese are the fifth leading danger for worldwide passing’s. Essentially 2.8 million adults are die every year because of overweight and obese. Overweight or obesity leads to cause development of many chronic diseases like cardiac, Type 2 diabetes, respiratory diseases and hypertension and early death too. Scientific studies shown that the health risks of excessive body fat were associated with small increase in body weight.(6)

Prevalence of Vitamin d deficiency is more common in obese subjects are well documented , due to high volumetric dilution the fat present in the serum, liver and muscle could not excreate completely. Low vitamin D leads to cause obesity (7).

Low serum vitamin D is associated with obesity. It is one of the metabolic problems. Body mass index(BMI) and abdominal fat tissues are known determinants of Vitamin D staus and also Vitamin D deficiency is more common in obese individuals (8).

Vitamin D palys a major role in maintaining blood glucose homeostasis regulate insulin mechanism and problems associated with obesity. Pregnant women with high pigmented skin are at risk of developing Vitamin D deficiency and obese children and adults who are not have adequate exposure from direct sun are at especially high risk (9).

The increased risk of vitamin D deficiency among obese is not clear but theories explaining that the inadequate exposure to solar ultra violet (UV) radiation by obese individuals which is responsible for synthesis of Vitamin D3 (10).

The optimal range of 25-Hydroxy Vitamin D is reported (25-80 ng/mL), and the definition of Vitamin D insufficiency reported (<30 ng/mL) and deficiency range is (<20 ng/mL) (11).

Hypovitaminosis D depends on lifestyle and environmental factors which reduces the exposure to sunlight that required for ultraviolet-B induced Vitamin D production directly in skin (12).

INTRODUCTION TO mHEALTH

Mobile phone usage has been increasing worldwide, mobile technology helps to faster transfer of health information which is recently used highly in medical and public health practices. Mobile health is also defined as (mHealth).mHealth helpful to improve fast delivery of health care services,mainly in low and middle income countries. mHealth includes simple apps, voice messages, test messages,short videos and others (13).

mHealth or digital health interventions have become highly prevalent in scientific studies. mHealth and its tools were used globally by patients, consumers, students , researchers to enhance their knowledge easily by adopting basic technologies like text messages as simple and mobile applications to the complex. It is powerful tool to diagnose, treat, monitor and educating the people with reduced cost.(14)

mhealth technologies have been used since 1990 to manage chronic diseases which is causedby many different factors. The intervention aim to manage and change the lifestyle of the patients and to prevent many disorders. The functions of personal computer and digital devices applied to health is termed as mHealth or Digital health (15).

The mHealth technologies especially mobile apps provide an opportunity to help health care providers, It enhance and improve the communication, delivering the health services , treatment and management of different diseases and risk factors (16).

CHAPTER SCHEME

CHAPTER 1 – INTRODUCTION

Introduction about Vitamin D, Causes of Vitamin D Insufficiency, prevalence of Vitamin D associated Obesity, Functions of Vitamin D, Importance of Sunlight exposure, Awareness about Vitamin d associated Obesity, mHealth Intervention, Life style pattern and its related to vitamin D insufficiency, Serum Vitamin D and Objectives are discussed in this chapter

Objectives of the present study

PRIMARY OBJECTIVES

- Assess the prevalence of Obesity and Vitamin D insufficiency among young women
- Associate the relationship between obesity and risk factors of vitamin D insufficiency.
- Develop mHealth on obesity and Vitamin D insufficiency.

SECONDARY OBJECTIVES

- Study the socio-economic background, dietary habits, food consumption and lifestyle pattern of young obese and non obese women
- Implement mHealth and evaluate its effectiveness.
- Assess their nutritional knowledge.

CHAPTER II -REVIEW OF LITERATURE

This chapter Includes Vitamin D -History, sources, dietary recommendations, causes of vitamin D deficiency , prevention , awareness on vitamin D, obesity and vitamin D relationship, young women dietary habits and clothing style related to vitamin d insufficiency, mHealth.

CHAPTER III – METHODOLOGY

The study was conducted in VI phases. They are as follows:

I. SELECTION OF AREA AND SUBJECTS

The area selected for the study was Vellore city in Tamilnadu to study the prevalence of Vitamin D insuffiviency and Obesity among young women(18-25years). Many young women are identified as high BMI with low Vitamin D status in this area. Simple random sampling method was used to select 10% out of 123 colleges in Vellore district were selected representing four areas in Vellore district(North, South, East, West). A convenience sampling method was adopted to select the students for the study. Convenience sampling is the least expensive and easiest and doesn't need a rundown of population(17). Participation in the study was voluntary and before participating the informed consent was obtained from each student. The selection of this age group is to provide more insight on obesity associated vitamin D insufficiency and prevent vitamin D and obesity related diseases in future through mhealth intervention. The students were selected with inclusion and exclusion criteria.

II. Development of mHealth:

Tools for mhealth intervention includes OBEVIT APP, You tube Videos, facebook page ,Script for Vitamin D and Obesity, Created WhatsApp group were developed to educate the selected young women. vitamin D and Obesity Related Information , Research , News were shared using the App. Vitamin D associated obesity signs and symptoms, causes was shared through you tube videos. To Evaluate the mHealth intervention two whatsapp group were developed as control and Experimental.

The tools include vitamin D and obesity introduction, absorption, sources, importance of sunlight exposure, Dietary vitamin D.

III. CONDUCT OF ONLINE SURVEY:

After obtaining formal permission from various institutions , with the help of higher authorities the created google meet link was sent to students to obtain socio demographic profile like family income, religion, food and dietary intake and physical activity patterns from all the selected students. The dietary information was gathered utilizing three day recall method and food frequency questionnaire. From the food intake, the mean nutrient intake of the participants was calculated using and compared with the RDA suggested by ICMR (2020) (18).

IV PREVALENCE OF OBESITY

In this phase screening for obesity done using Anthropometry measurement Height was measured for all the students in centimeters using portable height measuring rod with an accuracy of 0.1 cm For measuring body weight digital weighing scales were used. Initially the weighing scale is set with zero to prevent error. BMI was calculated from the measured height and body weight using the formula weight in (kg) divided by height in (m2) according to WHO classification (19). After screening for obesity the students with elevated BMI were selected for next phase and equally the students with normal BMI were included for correlate vitamin D associated Obesity.

V ASSESSMENT OF VITAMIN D INSUFFICIENCY & ASSOCIATED OBESITY

To assess Serum Vitamin D and Bone mineral density – 10% Of Obese Women {40}& same 40 Non Obese Women were Selected. Due to the pandemic situation the Human ethical committee permitted to assess the serum vitamin d as secondary data . The selected participants were requested to test in a standard lab. Bone mineral density measured – by using keva magnetic resonance. The data collected and intrepreted. Data related to sunlight exposure, use of sunscreen lotion, clinical signs and symptoms were obtained from both obese and Non-obese. The study

protocol approved by the Ethical Committee of Institutional Human Ethics Committee**(Approval number: IHEC/19-20/FSN/39).**

VI- Implementation and Evaluation of mHealth intervention for Obese participants.

The developed mhealth tools like youtube, facebook ,whats app group, Obevit app implemented in this Phase.

Youtube channel- For the period of one month the videos created related to vitamin d and obesity and sent to the selected participants and obtained the feedback.

Facebook page - vitamin D and Obesity news, research, articles and messages shared to the participants.

Whatsapp group- Two groups created one as Experimental and one as control group. For experimental group Per day two Short messages sent for a period of one monthand for control few basic messages sent with one video lecture. Pre and post intervention questionnaires administered. The datas were evaluated.

OBEVIT APP- Created the App with the help of software experts. This app covered basic introduction, research evidence, dietary allowances, sample menu with method of preparation content may include video, articles and audio related to vitamin D and Obesity.

The gains in knowledge were assessed with a post intervention questionnaire and compared with pre intervention data.

CHAPTER IV - RESULTS AND DISCUSSION

- The age group between 18-25 years were included for the study. Among the selected young women 17.4 percent were belongs to 18 years,27 percent were 21 years, 30.2 percent were 22 years, 12.6 percent were 23 years and 12.5 percent were 25 years.
- In online survey the findings of family income of the selected participants are 39 percent belongs to low income , 48 percent belongs to middle income and 13 percent were from low income family. In this 77.7 percent hindu, 12.1 percent were muslim students,9.2 percent were christian and 0.9 percent from jainism.
- Among the selected participants 43 percentage undergraduate III year ,38 percent from II year students,12 percent from post graduate students and remaining 6.2 percent were from post graduate II year students.
- It was found that the overall dietary intake of selected participants the cereal intake is more when comparing to all food groups. 100 percent participants were taking cereals in daily basis , whereas the consumption of pulses 69 percent daily

  21 percent weekly and 10 percent monthly. Vegetable intake 57 percent daily, 24 percent weekly and 29 percent monthly. Fruit intake was 47 percent, 38 percent and 15 percent in daily, monthly and weekly basis.
- Intake of Energy,protein, fat, carbohydrate, riboflavin, niacin,pyridoxine,andtotal folate intake was above RDA recommendation.the intake of Fiber,calcium,phosphorous,iron,beta carotene,thiamine and Vitamin C was below RDA allowances.
- From the total respondents 3.4 percent and 2.2 percent spent their time in indoor and outdoor activities.Mainly exercise like walking 5.8 percent and jogging 0.9 percent found.the mode of travel by the respondents among these 53percent travel by bus, 6 percent travel by auto , 20.9percent travel by bike , 4.8 percent by bicycle , and 14.9 percent by walk as a whole .

- Through anthropometry measurements the stages of BMI value of total respondants to classify them as obese, overweight, normal, and underweight based on percentage it has been identified that from total samples 6.4 percent obese grade I, 4 percent Obese grade II, 7.1 percent overweight, 61.2 percent normal and 18.9 percent underweight.
- Mean BMI of the obese young was found that 30.858 ±0.173, P-Value is 0.0280
- the adequate sun exposure time by the respondents identified that the non obese 28 percent of them has exposure to about 0-1 hour, 13 percent of them has exposure of about 2-4 hours, 5 percent has 4-6 hours exposure, exposure which resembles in their deficiency signs. In case of obese 41 percent has expose 0-1 hours,11 percent 2-4 hours and 2 percent has exposure about 4-6 hours.
- The signs of vitamin D deficiency were observed higher in obese young women when compared to non obese.
- Serum vitamin d tested for 40 obese and 40 non obese students.it was found that the students 25 percent are deficient ,27.5 percent having Insuffieciency and 47.5 percent having sufficient vitamin D status. The mean vitamin D levels for obese and non obese is27.552 ±1.385and 36.3775 ±2.05. The overall t-value is 3.2048 and P-value00269 (significant at $p < .01$).
- Among the selected obese and non obese the bone mineral density results more similar but severe abnormal Bone Mineral found in Obese participants.
- It was found that after implementing mhalth education through whats app group , there was an improvement in their knowledge about vitamin D and Obesity of the experimental group when compared to control.in experimental group the before and after intervention showed significant level at($p<0.01$)
- From the total sample 82.1percent likes the OBEVIT app and the salient finding about overall feed back about mHealth intervention was 81 percent marked good for facebook, 67.8 percent marked excellent for obevit app.
- Post intervention serum Vitamin D were assessed for Obese, the value of t=0.1361with 95% confidence interval and R is 0.9972 with strong positive correlation and p-value is <.00001at significant level at($p<0.01$).

CHAPTER V - SUMMARY AND CONCLUSION

- The Area selected for the study was Vellore District Tamil Nadu due to familiarity and also to provide awareness about Vitamin D and Obesity.
- Out of 123 colleges 10% selected randomly and the age group between 18-25 years selected for the study.
- Socio economic status, religion, educational status, food and Dietary Intake , Nutrient Intake and physical activity were assessed using a structured questionnaire.
- For mHealth Intervention , created Google Meet link , facebook page, You Tube channel in the name of Vitamin D and Obesity, Whatsapp group and Obevit app.
- Obesity status of each participants were seen through Anthropometry measurement.
- After screening the total 400 obese students selected for the study and non obese included equally to correlate the deficiency signs for both category , other students were excluded from the research.
- Seleted participants are screened for vitamin D deficiency signs, the sunlight exposure of non obese is higher when compared to Obese but use of sunscreen lotion, frequency of pain in the bone and frequency of fractures of obese is higher compared to Non-obese.
- Serum Vitamin d assessed for the selected obese and non obese. It was found that 11.25 percent of the students whose BMI between (30.0-34.9) are having insufficiency and 05 percent are deficient.
- It was observed that higher Body Mass Index students are highly deficit in serum Vitamin D status.
- Implemented mHealth Intervention were Evaluated with pre and post awareness questionnaire.

- After intervention the serum Vitamin D were assessed for Obese, the result obtained with strong positive correlation.

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